CUFF VOLUME CONSTRAINING DEVICE

CROSS-REFERENCE TO RELATED APPLICATION

This application claims the benefit of U.S. Provisional Patent Application Ser. No. 60/633,352 filed Dec. 3, 2004, entitled "CUFF VOLUME CONTROLLING DEVICE," which is hereby incorporated by reference herein for all purposes.

BACKGROUND

This invention relates to non-invasive blood pressure monitoring devices, systems, and methods and more particularly to systems, methods, and devices for volumetrically constraining blood pressure cuffs. Non-invasive blood pressure ("NIBP") monitors typically require periodic testing to validate whether they are operating correctly. This requirement may be met by using a simulator to generate pressure signals that approximate those created by a patient's arm in surface contact with a blood pressure cuff. In some applications of a simulator to an NIBP, the cuff may wrap on itself, which may result in a larger than ideal volume. The accuracy of the pressure pulse simulation is enhanced if the cuff volume is constrained to approximately match the volume it would otherwise displace if applied to an actual patient's arm. One attempt at constraining the expansion of the cuff in a simulated condition has the cuff wrapped around a rigid article often termed a mandrel and having a diameter of the average or typical patient's arm. When a mandrel is used to simulate the geometry of the average or typical patient's arm, the cuff is wrapped around the mandrel such that a surface of the cuff contacts the mandrel in the same manner as it would a patient's arm.

SUMMARY OF THE INVENTION

An exemplary embodiment of the present invention includes a system for testing a non-invasive blood pressure measurement device, wherein the blood pressure measurement device includes a blood pressure monitor and a blood pressure cuff. The system includes a blood pressure simulator adapted to be pneumatically connected to the blood pressure cuff and blood pressure monitor; and a cuff volume constraining element that comprises at least one hollow member adapted to receive the blood pressure cuff.

Another exemplary embodiment of the present invention includes a system for testing a non-invasive blood pressure measurement device. This system includes a blood pressure monitor, a blood pressure cuff, a blood pressure simulator, and a cuff volume constraining element that comprises at least one hollow member. The blood pressure monitor, the blood pressure cuff, and the blood pressure simulator are pneumatically connected during testing and the blood pressure cuff is placed inside a cuff volume area in the at least one hollow member as a and thereby limit the maximal diameter and maximal volume to which the blood pressure cuff may expand during testing.

Another exemplary embodiment of the invention includes a method for testing a non-invasive blood pressure measurement device pneumatically connected to a blood pressure cuff, a blood pressure simulator, and a blood pressure monitor. The method includes the steps of placing the blood pressure cuff into a volume cuff area or aperture of the cuff constraining device having at least one hollow member so as to limit the maximal diameter and maximal volume to which the blood pressure cuff may expand during testing; and pneumatically expanding the blood pressure cuff while the blood pressure simulator simulates a test subject.

Another exemplary embodiment of the invention is an apparatus having an aperture for receiving a blood pressure cuff and constraining the volumetric expansion of the blood pressure cuff while testing a pneumatically coupled non-invasive blood pressure measurement device. The exemplary apparatus further comprises at least one sheet of flexible and substantially inelastic material connected at a first longitudinal end to a second longitudinal end.

BRIEF DESCRIPTION OF THE DRAWINGS

For a more complete understanding of the present invention and for further features and advantages, reference is now made to the following description taken in conjunction with the accompanying drawings, in which:

FIG. **1** is a perspective view of an exemplary cuff constraining device, according to an exemplary embodiment of the invention;

FIG. **2** is a front view of the exemplary cuff constraining device, according to an exemplary embodiment of the invention;

FIG. **3** is a side view of the exemplary cuff constraining device, according to an exemplary embodiment of the invention;

FIG. **4**A is a side view of an exemplary cuff constraining device; according to an another exemplary embodiment of the invention;

FIG. **4**B is a perspective view of the exemplary cuff constraining device, according to an exemplary embodiment of the invention;

FIG. **5**A is a top plan view of the exemplary cuff constraining device, according to an exemplary embodiment of the invention;

FIG. **5**B is a bottom plan view of the exemplary cuff constraining device, according to an exemplary embodiment of the invention;

FIG. **6**A is a perspective view of an exemplary h cuff constraining device, according to an exemplary embodiment of the invention;

FIG. **6**B is a side view of the exemplary cuff constraining device, according to an exemplary embodiment of the invention;

FIG. **6**C is a top view of the exemplary cuff constraining device, according to an exemplary embodiment of the invention;

FIG. **7**A is an exemplary diagram of the cuff constraining device and a non-invasive blood pressure measurement device, according to an exemplary embodiment of the invention; and

FIG. **7**B is an exemplary diagram of the cuff constraining device and a non-invasive blood pressure measurement device, according to an exemplary embodiment of the invention.

DETAILED DESCRIPTION

The present invention in its several embodiments includes a device for constraining cuff volume during NIBP simulation. Some exemplary embodiments of the cuff volume constraining device or element comprise a flexible inelastic hollow cylindrical member which is placed outside the outer surface of a blood pressure cuff. The blood pressure cuff is connected pneumatically to a blood pressure simulator and a blood pressure monitor. During operation, the blood pres-